



July 12, 2005

William A. Bonnet  
Vice President  
Government & Community Affairs

The Honorable Chairman and Members of the  
Hawaii Public Utilities Commission  
465 South King Street, First Floor  
Kekuanaoa Building  
Honolulu, Hawaii 96813

Dear Commissioners:

Subject: Docket No. 03-0417  
East Oahu Transmission Project ("EOTP")

HECO respectfully submits its information requests ("IRs") regarding the Division of Consumer Advocacy's Direct Testimony and Exhibits, filed June 21, 2005, and Life of the Land's Statement of Position, filed June 22, 2005, in the subject proceeding.<sup>1</sup> The Public Officials did not submit testimony, and as a result, HECO does not have IRs for the Public Officials.

Sincerely,

Attachments

cc: Division of Consumer Advocacy (3 copies)  
Henry Q Curtis, Life of the Land (3 copies)  
Scott K. Saiki (3 copies)  
Karen H. Iwamoto, Palolo Community Council (1 copy)  
Traver Carroll, Hoolaulima O Palolo (1 copy)  
Corey Y.S. Park, Esq./Pamela W. Bunn, Esq., Malama O Manoa (1 copy)  
Daisy M. Murai, Kapahulu Neighbors (1 copy)

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<sup>1</sup> By letter dated May 31, 2005, the parties and participants to the EOTP proceeding submitted a stipulated procedural schedule for the remainder of this docket, which, among other things, called for the filing of written testimonies, exhibits and workpapers by the Other Parties on June 21, 2005.

**Hawaiian Electric Company, Inc. ("HECO")**  
**Information Requests ("IRs") to the Division of Consumer Advocacy ("CA")**

**HECO/CA-IR-1**      Ref: CA-T-1, page 2, lines 1-11; CA-100.

To supplement Mr. Kiser's description of his experience and resume, and in addition to the experience listed as Projects Involving Regulatory Filings in CA-100, please provide (i) descriptions of other projects and studies that Mr. Kiser has completed in the area of electrical system studies and analyses of utility operations, and (ii) studies or analyses involving the design and/or planning of electric transmission systems. Please list:

- a. Project Name and Date Completed
- b. Client Name and Location
- c. Type and size (MW) of System Studied (such an industrial installation or electric utility system, or other type)
- d. Voltage levels included in the study or project and types of load served by the system
- e. Objective of the study and the types of analysis completed.

**HECO/CA-IR-2**      Ref: CA-T-1, page 7, lines 16-18.

The testimony concludes that "HECO did not properly plan or apply proper planning criteria when pursuing the Kamoku-Pukele 138kV Underground Alternative (via Waahila Ridge)."

- a. Does the CA mean HECO's criteria for Transmission System Planning were in some manner incomplete or inappropriate for the HECO planning process?
- b. If the response to subpart "a" above is anything other than an unqualified "no", please identify the manner in which the criteria were incomplete or inappropriate, and fully explain the basis for the conclusion.
- c. Does the CA mean that the criteria for Transmission System Planning were incorrectly applied?
- d. If the response to subpart "c" above is anything other than an unqualified "yes", please fully explain your response.

**HECO/CA-IR-3**      Ref: CA-T-1, page 7, lines 16-18.

The first page of the East Oahu Transmission Project Alternatives Study Update (December 2003), filed as Exhibit 5 to HECO's Application, identifies a number of electric power system planning studies done by HECO during the 1991-1998 time period that HECO planned and filed for approval of the Kamoku-Pukele 138 kV Partial Overhead (via Waahila Ridge)/Partial Underground Alternative including the East Oahu 138 kV Requirements Study (Updated August 1992), the Kamoku-Pukele 46 kV Alternatives Study (August 1994) and the East Oahu Transmission Requirements Update (March 1998). On page 20 of CA-T-1, the witness indicates that he reviewed the 3 studies listed above.

- a. Please describe the understanding of the witness as to the load growth and system configuration assumptions used in each study.
- b. Does the witness contend that the study assumptions were inappropriate or incomplete, and, if so, explain the basis for the contention.
- c. Would a 138 kV connection between the Kamoku and Pukele Substations provide any present or potential future electric power system benefits that should be considered in transmission planning that would either not be provided by or would be provided in greater

degree than by the proposed EOTP 46 kV reconfiguration project, and, if so, identify such benefits.

**HECO/CA-IR-4**      Ref: CA-T-1, page 7, lines 16-18; page 13, lines 9-10.

Please clarify the specific alternative being referred to by the CA when it references the “Kamoku-Pukele 138 kV Underground Alternative (via Waahila Ridge)”? Is the CA referring to the underground/overhead 138kV line alternative that was pursued from 1991 to 2002, or the 138kV underground alternative evaluated in 2003?

**HECO/CA-IR-5**      Ref: CA-T-1, page 8, lines 14-15; page 9, lines 15-18; page 90, lines 13-15; page 91, lines 14-16; page 91, line 21 to page 92, line 2; page 125, lines 4-5; page 126, lines 5-9.

The CA states that the additional transformer proposed to be installed at the Archer Substation as part of Phase 2 is not necessary at this time.

- a. Is it the CA’s position that the three proposed 46kV circuits also associated with Phase 2 of the proposed project, i.e., the Archer 45, Archer 47, and Archer 48 46kV circuits, are also not necessary at this time?
- b. If the CA believes that the proposed Phase 2 46kV circuits should still be constructed, please specify the power source for the circuits, i.e., to which transformers should the circuits be connected, and what other circuit reconfigurations or reconnections, if any, would be necessary?

**HECO/CA-IR-6**      Ref: CA-T-1, page 10, lines 1-4; page 121, line 18 to page 122, line 3; page 126, lines 10-13.

CA-T-1, page 122, lines 20-22 states, in part, “... the segments between Pumehana Street to Date Street and Winam Ave. to Mooheau Ave. could possibly be constructed as overhead since there are existing overhead lines in the area.” In addition, CA-T-1, page 123, lines 9-10, states “I recommend that the Company at [sic] look further into this option [constructing the Pumehana Street to Date Street and Winam Ave. to Mooheau Ave. segments as overhead 46 kV circuits] since it has the potential of saving ratepayers \$408,000.”

However, CA-T-1, page 8, lines 10-12, states “[p]ursuant to the requirements of HRS 269-27.6(a), all except two short segments of the 46kV lines that are part of HECO’s EOTP should be placed constructed, erected or built below the surface of the ground.” (A similar conclusion is stated in CA-T-1, page 124, line 20 to page 125, line 2.) Similarly, CA-T-1, page 10, lines 1-4 states “[t]he project cost should be reduced by \$408,000 for certain proposed underground 46kV segments, namely, the Pumehana Street to Date Street and Winam Avenue to Mooheau Avenue segments, which could be constructed as overhead segments, pursuant to HRS §269-27.6(a).” (A similar recommendation is stated in CA-T-1, page 126, lines 10-13.)

It is unclear from the above-referenced testimony whether the CA is recommending that HECO “look further into” the option of installing the two short segments overhead, or is recommending that HECO install the two short segments overhead.

- a. Please clarify if the CA is recommending that HECO construct the two segments overhead or that HECO “look further into” constructing the two segments overhead? Please specify

- each of the steps that HECO should do as part of “look[ing] further into” constructing the two segments overhead.
- b. If the CA is recommending that the two short segments be constructed overhead, were any other factors considered besides cost. If “yes”, please explain what other factors were considered and how such factors were considered.
  - c. If the CA is recommending that HECO consider installing the two segments overhead, what factors in addition to cost does the CA believe should be considered, and how should each other factors be considered?
  - d. Please address with specificity each of the eight factors identified in Issue #3 from Order No. 20968 (i.e., cost, timeliness and schedule, effectiveness, construction impacts, electromagnetic fields, other impacts, in any, public sentiment, public welfare in general) regarding constructing the Pumehana Street to Date Street segment overhead.
  - e. Please address with specificity each of the eight factors identified in Issue #3 from Order No. 20968 (i.e., cost, timeliness and schedule, effectiveness, construction impacts, electromagnetic fields, other impacts, in any, public sentiment, public welfare in general) regarding constructing the Winam Avenue to Mooheau Avenue segment overhead.
  - f. If HECO constructs the two segments from Pumehana Street to Date Street and Winam Avenue to Mooheau Avenue overhead, has the CA evaluated the potential for opposition and delay in the overhead construction of these two segments?
    - i. Unless the response to part “e” is an unqualified “no”, please provide in detail the CA’s evaluation regarding opposition and the potential for delays?
  - g. If the result of HECO’s “look further into” constructing the two segments overhead is that the lines should be constructed underground, is it the CA’s position that the EOTP project cost should still be reduced by \$408,000? Please fully explain your response.

**HECO/CA-IR-7**      Ref: CA-T-1, page 15, lines 14-16.

The CA states that 138kV systems are typically operated in a looped or network fashion, whereas 46kV systems are operated in a radial configuration. These statements seem to be in conflict with Exhibit CA-103, where 138kV, 46kV, 13.8kV and 220volts are all referred to as “Network”. Please explain the apparent conflict.

**HECO/CA-IR-8**      Ref: CA-T-1, page 19, lines 2-14; page 32, lines 3-7; page 32, line 14 to page 33, line 6; page 33, line 19 to page 35, line 3; page 38, lines 7-13; page 39, line 2 to page 40, line 12; page 46, lines 1-10; page 48, line 19 to page 49, line 11; page 56, lines 9-15; page 73, line 14 to page 75, line 11; page 75, lines 18-20; page 77, lines 3-5; page 78, line 1 to page 79, line 2; page 80, lines 9-18; page 90, line 17 to page 91, line 16; page 98, lines 1-3; page 98, lines 15-17.

Please specifically describe and provide the following with regard to the studies and analyses that were performed by the CA to supplement the HECO analyses and/or used as the basis for the CA’s conclusions:

- a. All of the specific load flow cases that the CA configured and analyzed, and the electronic files in PTI PSS/E raw Version 29.5.5 format. Please explain in detail why the CA decided to analyze those specific cases in terms of the system configuration selected for study. In each case, please identify any adjustments to loads or generation.
- b. Please list and describe the contingency cases that were considered, both in terms of the degree of contingency (N-1, N-2, etc.) and the specific system elements that were outaged for the particular case. Please explain in detail why the CA selected each particular

- contingency or system configuration for study.
- c. For the 46kV switching analyses, please describe in detail the contingency cases studied and the loadings applied, along with all assumptions and the methodology used for determining loads, planning criteria utilized, and the criteria used to form conclusions.
  - d. Please provide all summaries and reports describing and documenting the input data, analyses, and procedures used to complete the CA's studies and analyses, and to form the CA's conclusions.

**HECO/CA-IR-9**      Ref: CA-T-1, page 19, line 18 to page 21, line 10.

The referenced testimony identifies the documents and studies reviewed by the CA for this proceeding. For each study listed, please provide the CA's understanding regarding:

- a. What these studies were based upon (e.g., planning criteria, past outages, etc.)?
- b. What was the purpose of the study?
- c. What were the conclusions and recommendations of the studies?
- d. What were the noted benefits of the alternative(s) proposed in each the studies?
- e. How the 138kV alternatives compared to the 46kV alternatives in terms of addressing the study objectives?

**HECO/CA-IR-10**      Ref: CA-T-1, page 23, line 8.

HECO searched the website [www.powerworld.com](http://www.powerworld.com), which provided a downloadable User Guide for the PowerWorld simulator, version 11. The link to this downloadable User Guide is as follows: <http://www.powerworld.com/Document%20Library/pw110UserGuide.pdf>

Page 26 of the User Guide lists several optional programs for the PowerWorld Simulator (e.g., Voltage Adequacy and Stability Tool (PVQV), Optimal Power Flow (OPF), etc).

- a. Did the CA utilize any of these optional programs used in its analysis to support its Direct Testimony?
- b. If the answer to part "a" is yes, please list the optional programs that were used, explain in detail how the optional programs were used and in which analysis they were used, and the results that the options provided.

**HECO/CA-IR-11**      Ref: CA-T-1, page 26, lines 7-9.

The CA states, "...PowerWorld was used to open the cases and verify that the cases did not have corrupted data and had reasonable results (reasonable mathematical results)."

- a. Please explain in detail the criteria that were used to determine if a case had "reasonable results".
- b. Did all 263 cases that were reviewed have "reasonable results"?
- c. Did any of the cases that were reviewed have results that were not "reasonable results"? If the answer is "yes", for each case with results that were not "reasonable results", please list the case and the reasons why the results were considered to be not "reasonable results".

**HECO/CA-IR-12**      Ref: CA-T-1, page 26, lines 19-20.

- a. For each of the cases that were compared, please list all the attributes from the PowerWorld Simulator and the HECO PTI Version 29.5.5 raw format that were compared (i.e., Bus voltages in volts, transmission line currents in amps, etc.).
- b. Please provide the results of all the load flow cases performed using the PowerWorld Simulator in PTI raw Version 29.5.5 format.

- c. Please explain the procedure used for reading into PowerWorld Simulator, HECO's load flow cases in PTI raw format and performing load flows using the PowerWorld Simulator.
- d. When comparing the cases between the PowerWorld Simulator and PTI raw format provided by HECO, were there any changes made to the data after it was read in from the PTI raw format before running a load flow to solve the case in the PowerWorld Simulator? If the answer is "yes", please provide a detailed list of all changes made for each case compared.

**HECO/CA-IR-13**    Ref: CA-T-1, page 27, lines 3-9.

- a. Please provide the input files in PTI Version 29.5.5 raw format for the new load flow cases that were developed.
- b. Please provide the graphical one-lines showing all information (i.e., MW, MVAR, amps, volts, etc.) as values (not pie charts) for each of the new load flow cases developed.
- c. Please explain the contingencies that were studied
- d. Please provide the input files in PTI Version 29.5.5 raw format used for the contingency analysis and the graphical one-lines showing all information as values for each of the contingencies studied.
- e. Did the CA use PowerWorld Simulator to perform the voltage sensitivity analysis?
  - i. If the answer to part e is "yes", please provide all input files in PTI Version 29.5.5 raw format and corresponding graphical one-lines showing all the information as values for each of the voltage sensitivity cases.
  - ii. If the answer to part e is "no", please explain in detail how the voltage sensitivity analysis was performed, including assumptions made and calculations performed. Please provide the results of the voltage sensitivity analysis.

**HECO/CA-IR-14**    Ref: CA-T-1, page 27, lines 19-22.

The CA states: "However, if only one of the two Waiau to Koolau 138kV lines and the Halawa to Koolau 138kV lines is out of service at the same time, the line rating is not exceeded on the remaining Waiau to Koolau 138kV line."

- a. Please list the year(s) the CA analyzed to support the above referenced statement.
- b. Please provide all PowerWorld Simulator input files in PTI Version 29.5.5 raw format and corresponding graphical one-lines showing all the information as values used to support this statement.
- c. If the PowerWorld Simulator was not used to support this statement, please provide the analysis, including all assumptions and calculations, which support this statement.

**HECO/CA-IR-15**    Ref: CA-T-1, page 28, lines 6-9.

The CA states that "...it appears that the Koolau/Pukele Overload Situation exists if no action is taken, although HECO may have overstated the problem since there are available means to defer or eliminate the problem at least through 2012." Please identify with specificity the "available means" to HECO to defer or eliminate the Koolau/Pukele Overload Situation at least through 2012.

**HECO/CA-IR-16**    Ref: CA-T-1, page 29, lines 7-9.

The CA states that “Rather, my analysis demonstrates that the overloading will occur in 2007 if nothing is done at this time.”

- a. Were load flow simulations performed using the PowerWorld Simulator for the referenced analysis?
  - i. If the answer is “yes”, for what years were the load flow simulations performed (i.e., only 2005 and 2007, or 2005, 2006 and 2007?) Please provide all load flow simulations input files in PTI Version 29.5 raw format and the results of the load flows.
  - ii. If the answer is “no”, please explain in detail the analysis performed, including a list of all parameters used, to support the referenced statement.

**HECO/CA-IR-17**    Ref: CA-T-1, page 29, lines 9-11.

- a. Please explain what is meant by “The new load data, or assumptions presented in the 2003 Study as to the overload percentage (i.e., 100% versus 101%) could account for this minor difference in findings.”
- b. For all load flow simulations performed by the CA, did the CA consider that a transmission line was not overloaded if a transmission line was loaded at 100% or less?
- c. For all load flow simulations performed by the CA, at what load rating did the CA consider a transmission line overloaded?
- d. For all load flow simulations performed by the CA, did the CA consider that a transmission line was overloaded if the transmission line was loaded at 101% or more?
- e. For all load flow simulations performed by the CA, at what load rating did the CA consider a transmission line not overloaded?

**HECO/CA-IR-18**    Ref: CA-T-1, page 30, line 19 to page 31, line 8; page 31, lines 14-16.

- a. Please explain in detail how the CA’s analyses took into consideration the effect that maintenance or construction projects could have on HECO’s ability to maintain the complete system as a starting point, and to reconfigure the system to mitigate overload problems during the periods of time (including extended outages) that a particular system element might be unavailable.
- b. For the contingency cases that the CA considered, describe the system elements outaged, and the resultant system configuration and load levels.

**HECO/CA-IR-19**    Ref: CA-T-1, page 31.

- a. In the table at the top of page 31, please confirm that if the Waiau-Halawa #1 and the Halawa-Koolau lines are unavailable, and if HECO transfers load from the Koolau/Pukele Substations to other substations, the line overload on the Waiau-Halawa #2 line occurs in 2012.
- b. Did the CA determine the year an overload occurs on the Waiau-Halawa #2 line if the Waiau-Halawa #1 and the Halawa-Koolau lines are unavailable, and the load information used in HECO’s 2003 East Oahu Alternatives Study (December 2003) analysis remained the same (without shifting any load from the Koolau/Pukele Substations to other substations)?
  - i. Please provide the year the overload occurs if this case was performed.
  - ii. Please provide the input files for this load flow cases in PTI Version 29.5 raw format and the graphical one-lines showing all information as values for each of the load flow

cases developed.

- iii. If the PowerWorld Simulator was not used for this analysis, please provide the analysis, including all assumptions and calculations, that were used to determine the year of the overload.

**HECO/CA-IR-20**    Ref: CA-T-1, page 31.

- a. In the table at the top of page 31, please confirm that if the Waiau-Halawa #2 and the Halawa-Koolau lines are unavailable, and if HECO transfers load from the Koolau/Pukele Substations to other substations, the line overload on the Waiau-Halawa #1 line occurs in 2012.
- b. Did the CA determine the year an overload would occur on the Waiau-Halawa #1 line if the Waiau-Halawa #2 and the Halawa-Koolau lines are unavailable, and the load information used in HECO's 2003 East Oahu Alternatives Study (December 2003) analysis remained the same (without shifting any load from the Koolau/Pukele Substations to other substations)?
  - i. Please provide the year the overload would occur if this case was performed.
  - ii. For each of the load flow cases developed, please provide the input files in PTI Version 29.5 raw format and the graphical one-lines showing all information as values.
  - iii. If the PowerWorld Simulator was not used for this analysis, please provide the analysis, including all assumptions and calculations, that were used to determine the year of the overload.

**HECO/CA-IR-21**    Ref: CA-T-1, page 31, lines 7-8.

- a. Please provide a table showing the load shifting analysis the CA performed to determine the 2012 overload date on the Waiau-Halawa #2 line if the Halawa-Koolau and the Waiau-Halawa #1 lines are unavailable.
  - i. Please provide the amount of load shifted in MW from the Koolau Substation and identify the destination substation that this load was shifted to.
  - ii. Please provide the amount of load shifted in MW from the Pukele Substation and identify the destination substation that the load was shifted to.
- b. Please provide a table showing the load shifting analysis the CA performed to determine the 2012 overload date on the Waiau-Halawa #1 line if the Halawa-Koolau and the Waiau-Halawa #2 lines are unavailable.
  - i.. Please provide the amount of load shifted in MW from the Koolau Substation and identify the destination substation that this load was shifted to.
  - ii. Please provide the amount of load shifted in MW from the Pukele Substation and identify the destination substation that the load was shifted to.

**HECO/CA-IR-22**    Ref: CA-T-1, page 31, lines 1-7.

- a. Please confirm that only one modification was made to HECO's base2007d.raw, base2012da.raw, base2017db.raw and base2022db.raw cases, which was to transfer 13 MW of load from the Pukele Substation to the Archer Substation.
- b. If additional modifications were made to the cases, please explain in detail each modification that was made.
- c. Were calculations performed to determine the load on each of the Archer Substations transformers after the 13 MW of load was shifted from the Pukele Substation to the Archer Substation under no 46kV line contingencies? If the answer is "yes", please provide the



calculations.

- d. Were calculations performed to determine the load on each of the Archer Substations transformers after the 13 MW of load was shifted from the Pukele Substation to the Archer Substation under 46kV line contingencies?
  - i. Was an analysis performed to determine the load on the Archer Substation transformers with automatic load transfers, which HECO utilizes on the 46kV system? If the answer is “yes”, please provide the 46kV line contingencies studied, list the automatic transfers that occurred (in MW and to which 46kV line transferred) and the transformer load calculations.
- e. Did the CA perform an analysis to determine the line currents in the 46kV lines under the normal state and under 46kV line and transformer contingencies with the 13 MW of load shifted from the Pukele Substation to the Archer Substation?
  - i. If the answer is “yes”, please provide all workpapers for the analysis performed.

**HECO/CA-IR-23**    Ref: CA-T-1, page 31, lines 12-16.

The CA states “There is no reason that this load cannot be moved to Archer at this time.” The load that is being referred to is the 7% of load from the Pukele Substation which automatically transfers to the Archer Substation in the event that the Pukele Substation is out of service.

- a. Provide the analysis performed which led to this conclusion, including the load flow analysis (under normal and contingency situations) and information on switches opened and closed based on the switching diagrams provided to the CA under protective order in response to CA-IR-15, part d.
- b. If an analysis was not performed, please explain how the CA reached its conclusion.

**HECO/CA-IR-24**    Ref: CA-T-1, page 33, lines 7-13.

The CA refers to the new Energy Management System (“EMS”) (Docket No. 03-0360) that HECO will be installing in the near future. The CA goes on to state that “[t]his manual switching could be less tedious in the near future since HECO is installing a new energy management system (i.e., Docket No. 03-0360. If appropriate switches and equipment have the capability of being operated from the new energy management system, the task of manual switching could be streamlined to make the process of moving this load from Pukele and Koolau Substations to Archer and School Substations much simpler.”

- a. Did the CA’s consultant review the information contained in Docket No. 03-0360?
  - i. If the answer to part a is “yes”, please identify the material from Docket No. 03-0360 that the CA’s consultant reviewed.
- b. Would the CA agree that other infrastructure and/or equipment (e.g., fiber optic lines, wireless communication devices, etc.) may be required to operate switches and equipment with the new EMS?
  - i. If the answer to part b is “yes”, please describe the CA’s understanding of the infrastructure and/or equipment that would be required to operate switches and equipment with the new EMS.
- c. Did the CA calculate the costs for switches, equipment, and infrastructure that would be needed to provide the capability of operating these switches and equipment from the new EMS?
  - i. If answer to part c is “yes”, please provide the cost estimates and information on the switches, equipment, and infrastructure used in the analysis.

**HECO/CA-IR-25**    Ref: CA-T-1, page 34, lines 12-21.

- a. The CA states “it appears that three circuits from Archer (Archer 41, 42A, and 46) can all tie to the Pukele circuits to serve some load.” Please identify the 46kV switching diagrams and the switches used to tie the Archer 41, 42A and the 46 circuits to the Pukele circuits.
- b. Please identify the Pukele circuits that were tied to the Archer 41 circuit, the Archer 42A circuit and the Archer 46 circuit.
- c. Please provide a breakdown of the 22 MW of load shifted from Pukele Substation to Archer Substation. Please provide a list that shows the MW amount assumed and the distribution substation (served by the Pukele Substation) serving the MW amount prior to the load shift.

**HECO/CA-IR-26**    Ref: CA-T-1, page 35, line 10.

The HECO 138kV system has two Waiau-Koolau 138kV transmission lines and one Halawa-Koolau line. Please identify which lines are meant in the referenced phrase “Halawa-Koolau lines”.

**HECO/CA-IR-27**    Ref: CA-T-1, page 35, lines 8-19.

Please confirm that the CA is stating that if 22 MW of load is shifted from the Pukele Substation to the Archer Substation:

- a. The overload on the Waiau-Koolau #1 138kV transmission line is deferred to 2012 if the Waiau-Koolau #2 and the Halawa-Koolau 138kV transmission lines are not available.
- b. The overload on the Waiau-Koolau #2 138kV transmission line is deferred to 2012 if the Waiau-Koolau #1 and the Halawa-Koolau 138kV transmission lines are not available.
- c. The overload on the Halawa-Koolau 138kV transmission line is deferred to 2012 if the Waiau-Koolau #1 and Waiau-Koolau #2 138kV transmission lines are not available.

**HECO/CA-IR-28**    Ref: CA-T-1, page 35, lines 8-19.

Please provide the PowerWorld Simulator input files in PTI Version 29.5 raw format, the graphical one-lines showing all the information using values and any other analysis used to determine the 2012 deferral.

**HECO/CA-IR-29**    Ref: CA-T-1, page 38, lines 18-22.

- a. Please identify all of the “long-term system improvements” the CA believes are necessary to address the Koolau/Pukele Overload Situation. Please provide the basis for the CA’s belief.
- b. In what timeframe should each of the improvements be implemented? Please provide the basis for the CA’s belief.

**HECO/CA-IR-30**    Ref: CA-T-1, page 39, lines 5-9.

- a. Please identify which PTI raw file(s) were examined.
- b. Were any modifications to HECO’s PTI raw data done for the examination? If the answer is “yes”, please describe the modifications that were performed.

**HECO/CA-IR-31**    Ref: CA-T-1, page 39, lines 10-14.

- a. Does the PowerWorld Simulator provide the capability to scale all of the loads at each transmission bus by a percentage from the previous year?
- b. Does the PowerWorld Simulator provide the capability to scale the load at each transmission

bus by varying percentages, i.e., 4% increase at Pukele Substation, 2% decrease at Archer Substation, 7% increase at Kamoku Substation, etc.?

**HECO/CA-IR-32**    Ref: CA-T-1, page 39, line 20 to page 40, line 3.

Please identify the switches in the 46kV switching diagram that could be used to shift load from the Downtown Substations to the Pukele and Koolau Substations.

**HECO/CA-IR-33**    Ref: CA-T-1, page 46.

- a. Please provide the reference for the load information contained in the table (in the middle of page 46) prior to adjustments made by the CA.
- b. Please provide the page(s) and line numbers in CA-T-1 that describe the ability to backup Pukele/Koolau loads from the Archer Substation.

**HECO/CA-IR-34**    Ref: CA-T-1, page 47, lines 5-7.

- a. Please confirm that the referenced 47 MW of load that is currently not served from two 46kV sources from different substations was derived by adding 1) the Kewalo load of approximately 11,300 kVA, 2) the Makaloa load of approximately 20,000 kVA and 3) the portions of the Piikoi load of approximately 15,400 kVA, as shown in the table on page 4 of CA-IR-15.
  - i. Please provide the power factors assumed to convert the 46700 kVA to MW, or did the CA intend to write approximately 47 MVA?
- b. If not, please provide how the 47 MW at Archer Substation was derived.

**HECO/CA-IR-35**    Ref: CA-T-1, page 47, lines 11-13.

- a. Please confirm that the referenced 2 MW of load that is currently not served from two 46kV sources from different substations was derived by adding 1) the BWS Wahiawa load of approximately 800 kVA, 2) the BWS Wahiawa Wells #2 load of approximately 500 kVA and 3) the BWS-Mililani Mauka load of approximately 600 kVA, as shown in the table on page 5 of CA-IR-15.
  - i. Please provide the power factors assumed to convert the 1,900 kVA to MW, or did the CA intend to write approximately 2 MVA?
- b. If not, please provide how the 2 MW at Wahiawa Substation was derived.

**HECO/CA-IR-36**    Ref: CA-T-1, page 48, line 7 to page 49, line 11.

The CA mentions other steps and opportunities that HECO should have been taking to improve the reliability of the Pukele Substation, including utilization of the Kewalo and Kamoku Substations and constructing tie circuits to the School and/or Iwilei Substations.

- a. Please provide the analysis conducted by the CA which supports its testimony. Please include all load flows performed, assumptions used, the impact to the reliability of the Pukele Substation (i.e., the amount of load that would be fully backed up by these improvements if both 138kV transmission lines were unavailable), analysis performed, cost estimates for equipment required to utilize the Kewalo and Kamoku Substations and to create tie circuits to the School and/or Iwilei Substations.

**HECO/CA-IR-37**    Ref: CA-T-1, page 50.

Based on the Kakaako Master Plan Study referenced in the testimony, the study considered two

types of transformers for serving the distribution load, 138kV-12kV transformers and 138kV-25kV transformers. The Kakaako Master Plan Study also compared the cost of the two plans studied on page 16 of the study, which included assessing the number of ducts required at 12kV versus 25kV, the relative voltage drop of using 12kV circuits versus using 25kV circuits, distribution conversions with using 12kV versus using 25kV and estimated Substation and distribution circuit/duct costs.

At the time of writing the CA's direct testimony, did the CA perform the same type of analysis as shown on Page 16 of the Kakaako Master Plan Study for utilizing 138kV-46kV and 46kV-12kV transformers and ductlines to address the issues of serving the Kakaako load? If yes, please provide the analysis and cost estimates performed.

**HECO/CA-IR-38**    Ref: CA-T-1, page 51, lines 16-18.

The CA states the Kakaako Master Plan Study "should have encompassed not only the maximum load growth, but the minimum as well, (which is basically the trend that has occurred for this area)."

- a. If HECO had included a minimum load growth study, how should HECO have incorporated this scenario into its distribution plan to serve the Kakaako load?
- b. At the time of writing the CA's direct testimony, did the CA analyze a minimum load growth scenario using the same assumptions outlined in the Kakaako Master Plan? If yes, please provide the results and workpapers for the analysis.

**HECO/CA-IR-39**    Ref: CA-T-1, page 52, lines 17-21.

- a. Please provide the analysis performed which supports the statement "The best solution is to have multiple transmission sources and the ability for 46kV and other distribution circuits to have at least one backup circuit, preferably from a substation fed by another transmission substation."
- b. If the CA performed an analysis, does the analysis include addressing all of the issues identified in the East Oahu 138kV Requirements Updated (August 1992) study, which was filed with the Applications for approval in Docket Nos. 7526 and 7602, and selecting the "best solution"
- c. At the time of Docket Nos. 7526 and 7602, one of the assumptions in the August 1992 East Oahu 138kV Requirements Updated study was that Honolulu Power Plant would be retired at the end of 1994. Is it the CA's position that at the time of Docket Nos. 7526 and 7602, one of the assumptions in the August 1992 East Oahu 138kV Requirements Updated study was that Honolulu Power Plant would be retired at the end of 1994?
- d. Would the Kamoku 46kV Underground Alternative – Expanded resolve the Downtown Line Overload if the Honolulu Power Plant is retired?

**HECO/CA-IR-40**    Ref: CA-T-1, page 53, lines 24-28.

- a. Please define the criteria the CA used to consider if a 46kV alternative is viable.
- b. Based upon these criteria, which if any of the options HECO studied in the August 1994 Kamoku-Pukele 46kV Alternatives Study (under the assumptions used in the study, including the retirement of Honolulu Power Plant) would the criteria consider to be a viable 46kV alternative? Please explain the basis for the conclusion.

**HECO/CA-IR-41**    Ref: CA-T-1, page 55, lines 3-8.

Has the CA performed an analysis as to how the the 46kV sub-transmission system should be improved? If the answer is “yes”, please provide the analysis including assumptions, simulations and cost calculations.

**HECO/CA-IR-42**    Ref: CA-T-1, page 55, lines 13-18.

Please identify the “opportunities” that presented themselves to HECO to eliminate the Pukele Substation Reliability Concern, including the date(s), the action(s) HECO could have taken, and the basis for the CA’s position.

**HECO/CA-IR-43**    Ref: CA-T-1, page 60, lines 9-12.

- a. Please identify all of the “long term system improvements” that HECO can take to avoid future line overloading.
- b. Would a 138kV line between Kamoku and Pukele be part of the long term system improvements recommended by the CA?

**HECO/CA-IR-44**    Ref: CA-T-1, page 71, line 16 to page 72, line 7.

- a. If considering only the electrical system benefits, and based on the CA’s knowledge of the partial overhead/partial underground Kamoku-Pukele 138kV transmission line alternative and HECO’s proposed Kamoku 46kV Underground Alternative – Expanded in this docket, does the Kamoku 46kV Underground Alternative address the Koolau/Pukele Line Overload, the Downtown Line Overload, the Pukele Substation Reliability and the Downtown Substation Reliability concerns equally as well as the partial overhead/partial underground Kamoku-Pukele 138kV transmission line?
- b. If the answer is that the two alternatives are not equal, which one is the more “robust” solution and why? Please explain your answer in detail.

**HECO/CA-IR-45**    Ref: CA-T-1, page 73, lines 16-22.

- a. Please confirm the utilization analysis described and shown in CA-107 assumes all 138kV transmission lines are in service.
- b. Were utilization calculations performed for the HECO system under 138kV line contingencies?
  1. If the answer to part b is “yes”, please provide the calculations in the form of tables similar to CA-107 of the contingency analysis and the assumptions made (i.e., the single and/or double contingencies considered).

**HECO/CA-IR-46**    Ref: CA-T-1, page 74, lines 4-9.

Please identify the PTI raw case name used for the utilization review identified in the referenced testimony.

**HECO/CA-IR-47**    Ref: CA-T-1, page 74, lines 13-14.

- a. Is the CA’s conclusion based on the utilization tables shown in CA-107 and CA-108, which assume normal operation?
- b. Did the CA consider single line contingencies and double line contingencies, which are part of HECO’s transmission planning criteria when making its conclusion? If the answer is “yes”, for either or both contingencies, please provide the basis for the CA’s conclusions

under each contingency.

**HECO/CA-IR-48**    Ref: CA-T-1, page 76, lines 11-12.

- a. Please explain the basis for the referenced statement that sub-transmission lines should be loaded to approximately 50% of capacity to allow the circuit to back-up another circuit.
- b. Has the CA performed an analysis on the effect to HECO's sub-transmission system as a result of following this criteria? If yes, please provide the analysis and workpapers for the analysis.
- c. In making the referenced statement, did the CA assume that HECO's sub-transmission system is configured where an entire circuit is always backed up by the same back-up circuit and vice versa?
- d. In making the referenced statement, did the CA consider that when a circuit containing multiple distribution substation transformers is automatically transferred to the back-up 46kV circuit, the distribution substation transformers typically are transferred to multiple 46kV back-up circuits?

**HECO/CA-IR-49**    Ref: CA-T-1, page 79, line 12 to page 80, line 11; page 102, line 13 to page 103, line 14.

- a. Please explain in detail the methodology used and data analyzed in the comparison of the reliability of the 138kV and 46kV alternatives.
- b. Please describe in detail the 138 kV and 46 kV alternative system configurations for lines and substations, etc., analyzed and the criteria used to form the CA's conclusions.

**HECO/CA-IR-50**    Ref: CA-T-1, page 82, lines 7-16.

Are there electric power system benefits provided by the 138kV alternative that HECO pursued previously that the proposed 46kV alternative does not provide or does not provide to the same degree? If the answer is anything but an unqualified "no", please describe the benefits that the 138kV alternative would have provided. If the answer is an unqualified "no", please explain the basis for that conclusion.

**HECO/CA-IR-51**    Ref: CA-T-1, page 83, lines 17-22 to page 85, line 5.

- a. Please identify all the materials from Docket No. 6617 that you reviewed at the time of preparing the CA's written direct testimony in this docket.
- b. Please identify CA's position on the proposed procedure (e.g., rulemaking, etc.) and proceeding (i.e., which docket) by which the CA's recommendation that HECO be required "to incorporate transmission, sub-transmission and planning studies into the IRP Framework" would be implemented. Is it the CA's position that the CA's recommendation apply to other Hawaii electric utilities?

**HECO/CA-IR-52**    Ref: CA-T-1, page 91, lines 12-16.

- a. Please provide the document (including HECO testimony reference and/or HECO study, page number, etc.) the CA referenced for the 54 MW of load transfer from the Archer to Koolau Substation.
- b. Please include the workpapers or calculations used for the 54MW.

**HECO/CA-IR-53**    Ref: CA-T-1, page 88.

Did the CA perform transmission line utilization or transformer utilization analysis on HECO's system with the Kamoku 46kV underground alternative-expanded implemented? If the answer is "yes", please provide the calculations and the tables.

**HECO/CA-IR-54**    Ref: CA-T-1, page 104, lines 13-22.

Are there certain types of outages or situations that the 138kV alternatives would address that proposed 46kV alternative would not? If the answer is "yes", please describe the outages or situations.

**HECO/CA-IR-55**    Ref: pages 105-106; 113, lines 4-16.

- a. List any dockets or other proceedings in which Mr. Kiser has testified or otherwise participated relating to electromagnetic fields. Please provide copies of any such testimony.
- b. Identify all facts, documents and opinions which support your conclusion that "it could be possible to install the underground circuits in steel casing (or conduit), similar to the construction of the HPFF 138V line to further reduce the EMF levels produced by the 46 kV cables." Please provide examples of where this has been done.
- c. Identify all facts, documents and opinions which support your conclusion that steel casing would further reduce EMF levels produced by the 46 kV cables.
- d. Identify all magnetic field exposure assessments which support your conclusion that steel casing would further reduce EMF levels produced by the 46 kV cables.
- e. If you have performed, or if anyone has performed on your behalf, any magnetic field evaluations, studies or measurements for the East Oahu 46 kV Phased Transmission Line Project (i.e., EOTP) identify all such evaluations, studies or measurements and produce copies of same.

**HECO/CA-IR-56**    Ref: CA-T-1.

Are there any analyses or computations that the witness, or someone on his behalf, performed that are not included in the witness' testimony? If so, please describe in detail all such analyses or computations and provide copies of all documents relating thereto.

**HECO/CA-IR-57**    Ref: CA-106.

Do the load flows and percentages shown in CA-106 represent a portion of HECO's transmission system? If the answer is "yes", please provide the case being used and the location represented in the simulation.

**HECO/CA-IR-58**    Ref: CA-107.

- a. Please explain what a "No" in the column "Xfrmr" represents.
- b. Please provide the HECO load flow case that the information in the table is based upon.
- c. Please explain what the values for the columns "From MVA", "To MVA", "Lim A MVA", and "Lim B" represent and the reference for the data. Please include the workpapers and/or calculations made to the HECO original load flow data.
- d. Please compare the data in the table in CA-107 to the data for HECO's load flow case used for the table and explain the data variances between the two cases.
- e. Please explain how the "% of MVA A" was calculated for each of the rows shown in the table. Note: "% of MVA B" calculations are shown in the electronic files the CA provided

for CA-107. Similar calculations do not exist for “% of MVA A”.

**HECO/CA-IR-59**    Ref: CA-108.

- a. Please provide a description of the information under each column heading. For instance, please describe what is meant by a “Yes” or a “No” under the column “Xfrmr.”
- b. Please explain why the values under the column heading “From MW” and “From MVAR” are negative?
- c. Please provide a reference for the data contained in the tables for CA-108. Please include any HECO load flow cases used to populate the data tables and calculations used and not shown in the electronic files provided to HECO (i.e., “From MVAR”, “From MVA”, “Lim MVA” and “% of MVA A Limit (Max)” columns).
- d. Please compare the data in the tables in CA-108 to the data for HECO’s load flow case used in the table and explain the data variances between the two cases.
- e. Were the transmission substations’ utilization analyses performed for any other load flow cases provided by HECO? If the answer is “yes”, please provide the corresponding tables for these cases in the same format used in CA-108.
- f. Were the transmission substations’ utilization analyses performed for other scenarios not provided by HECO, i.e., different years, using different load assumptions, using different line contingencies? If the answer is “yes”, please provide assumptions used and calculations performed.
- g. Did the CA calculate the transformer loading and utilization under an N-1 transformer situation at the substation and increases in load on circuits served by the remaining transformers at the substation due to the transferring of load automatically from one circuit to another circuit at various distribution substations? If the answer is “yes”, please provide the assumptions and calculations performed.

**HECO/CA-IR-60**    Ref: CA-112.

- a. Please provide the reference document for the values contained in the column “MVA Rating”. Please explain any assumptions or calculations made to the values under the “MVA Rating” column.
- b. Please explain the negative “-18.1” MVA on page 3 of CA-112 for the year 2017.



**Hawaiian Electric Company, Inc. ("HECO")**  
**Information Requests ("IRs") to Life of the Land ("LOL")**

Please note that LOL's Statement of Position ("SOP") is not numbered. HECO has had to assign page numbers, starting with page 1 for the first page after the title page (i.e., page that begins with "June 22, 2005" and "Aloha Commissioners") and ending with page 26 (i.e., page with the signature of Henry Q Curtis).

**HECO/LOL-IR-1**    Ref: LOL SOP: Regarding the Direct Testimony of Henry Q Curtis, page 1. The introduction to the SOP identifies Henry Q Curtis as an expert witness.

- a. What are the witness's areas of claimed expertise?
- b. What are the witness's qualifications for each claimed area of expertise?
- c. Has the witness ever been qualified as an expert witness in any administrative or judicial proceeding? If the answer is "yes," for each such administrative or judicial proceeding identify the area of expertise for which the witness was qualified, the case name and docket number for the proceeding, and the date the witness testified as an expert, and please provide a transcript of the witness's testimony in such proceeding.

**HECO/LOL-IR-2**    Ref: LOL SOP, page 2.

LOL contends that, in "Part 5 we give an overview of renewable energy and energy efficiency options which could supply all of the electrical needs within the State." Please provide LOL's complete resource plan that identifies the specific resources (including specific components, location of components, costs of components, permitting requirements for components, time frame for permitting, acquiring and installing components, the extent to which commercially available components of the size and type included in LOL's resource plan have been installed in other locations, the sources relied upon for the foregoing information, and other information necessary for the Hawaii PUC to evaluate the cost, feasibility and impacts of LOL's resource plan) to supply all of the electrical needs of Oahu using the options identified in Part 5.

**HECO/LOL-IR-3**    Ref: LOL SOP, Part 4: The State Constitution, pages 18-19.

- a. In LOL's opinion, does the State Constitution address or imply the type and quality of electrical service that should be provided?
- b. Please explain how the Hawaii State Plan relates to the State Constitution.
- c. Please explain how the Hawaii State Plan relates to the proposed EOTP project.

**HECO/LOL-IR-4**    Ref: LOL SOP, Part 5: Renewable Energy Options, page 19.

LOL states that "[f]inally, Hawaii has an installed and developed capacity for cogeneration to be used during the transition to a sustainable energy self-sufficient future."

- a. Please provide an estimate, in MW, of the "installed and developed capacity for cogeneration" on Oahu, Maui, Hawaii, Lanai, Molokai, and Kauai. Please provide the basis for your response.

**HECO/LOL-IR-5**    Ref: LOL SOP, Part 5: Renewable Energy Options, Wind, page 20.

- a. Please confirm that LOL is in favor of a wind farm being built mauka of the Kahe Generation Station.
- b. Please explain LOL's understanding of the potential siting issues associated with the building of a wind farm mauka of the Kahe Generation Station.
- c. Please explain LOL's understanding of the potential permitting issues associated with the building of a wind farm mauka of the Kahe Generation Station.
- d. Please explain LOL's understanding of any site acquisition issues associated with the building of a wind farm mauka of the Kahe Generation Station.

**HECO/LOL-IR-6**    Ref: LOL SOP, Part 5: Renewable Energy Options, Wind, page 20.

- a. Please confirm that LOL is in favor of a wind farm being built on "mauka and makai lands of Kahuku.
- b. Please explain LOL's understanding of the potential siting issues associated with the building of a wind farm in Kahuku.
- c. Please explain LOL's understanding of the potential permitting issues associated with the building of a wind farm in Kahuku.
- d. Please explain LOL's understanding of any site acquisition issues associated with the building of a wind farm in Kahuku.

**HECO/LOL-IR-7**    Ref: LOL SOP, Part 5: Renewable Energy Options, Wind, page 20.

- a. Please be more specific as to the "mauka and makai lands of Kahuku" that LOL believes that economical wind farms could be built. (Please provide a map identifying the locations.)
- b. Has LOL performed an analysis (or aware of an analysis performed by someone else) that supports the development of an "economical wind farm" at Kahuku. If the answer is "yes", please provide a copy of the analysis
- c. Is Life of the Land aware of a proposed 80 MW wind farm at Kahuku?
- d. If the answer to part "c" is yes, please provide details on the wind developer, location, site layout, land agreements, etc.

**HECO/LOL-IR-8**    Ref: LOL SOP, Part 5: Renewable Energy Options, Wind, page 20.

- a. Please identify all other locations on Oahu, besides the two identified by LOL in its Statement of Position, where LOL believes that economical wind farms can and should be built.
- b. Please provide an estimate of the amount of MW that LOL believes could be provided by wind farms on Oahu, in addition to the 130MW identified by LOL in its Statement of Position. Please provide the supporting analysis for the estimate.
- c. In what timeframe does LOL estimate the wind farms identified in the response to part b could be built?

**HECO/LOL-IR-9** Ref: LOL, SOP, Part 5: Renewable Energy Options, Wave Power, page 20.

- a. Identify and provide any studies or analyses relied upon by LOL to support the statement that “[t]idal energy offers a great opportunity.”
- b. Is Life of the Land aware of any commercial tidal energy facilities that are operating in the world? If the answer is yes, please provide details on the tidal energy developer, type of equipment, size, etc.

**HECO/LOL-IR-10** Ref: LOL, SOP, Part 5: Renewable Energy Options, Wave Power, page 20.

- a. Does LOL characterize wave energy systems that generate electricity to be 1) commercially viable resources at this time, or 2) developing resources that may become commercially viable sometime in the future?
  - i. If LOL believes that wave energy systems are commercially viable resources at this time, please identify any projects currently operating in the United States?
  - ii. If LOL believe that wave energy resources are developing resources that may become commercially viable in the future, please provide LOL’s expected timeframe (e.g., 20 years) for this to occur.
- b. Does LOL believe that there may be negative environmental impacts associated with the use of tidal energy? If yes, please describe the negative environmental impacts.

**HECO/LOL-IR-11** Ref: LOL, SOP, Part 5: Renewable Energy Options, Wave Power, page 20.

- a. What is the kW size of the Marine Corps Base Hawaii wave energy pilot project?
- b. What is the cost per kW of this pilot project?
- c. Has the company implementing this pilot project ever implemented a full scale wave energy project? If the answer is yes, please provide the project cost, MW size and project location.

**HECO/LOL-IR-12** Ref: LOL, SOP, Part 5: Renewable Energy Options, Wave Power, page 20.

- a. Does LOL believe that a wave power facility is economically viable at this time? Please explain your response, with specificity.
- b. Please identify the locations LOL believes wave power facilities could be constructed on Oahu, and explain why the location(s) are suitable sites for wave power facilities.
- c. Please provide an estimate of the amount of MW that LOL believes could be provided by waver power facilities on Oahu.
- d. In what timeframe does LOL estimate the wave power facilities identified in the response to part c could be built?
- e. Please describe in detail the wave power facilities that could be constructed.
- f. Please provide an estimate of the capital costs, in \$/kW, to construct a wave power facility on Oahu. Please provide the basis, including workpapers, for the estimate.

**HECO/LOL-IR-13** Ref: LOL, SOP, Part 5: Renewable Energy Options, Sea Water Air Conditioning, page 20.

- a. What facilities infrastructure would have to be installed in the ocean and land to construct the two SWAC system in Honolulu?

- b. Where would the facilities be located?
- c. Does LOL believe that an Environmental Impact Statement should be required for the two contemplated seawater air conditioning projects?

**HECO/LOL-IR-14** Ref: LOL, SOP, Part 5: Renewable Energy Options, Sea Water Air Conditioning, page 20.

- a. Would LOL support all proposed projects on Oahu which would utilize Sea Water Air Conditioning ("SWAC")?
- b. If the answer to part a is "no", please describe the circumstances when LOL would not support SWAC on Oahu?

**HECO/LOL-IR-15** Ref: LOL, SOP, Part 5: Renewable Energy Options, Combined Heat and Power (Cogeneration), page 21.

- a. Please identify any cogeneration systems operating in Hawaii that utilize a renewable non-fossil fuel resource.